FINAL REPORT

MULTIDISCIPLINARY RESEARCH PROGRAM
IN SPACE SCIENCE AND ENGINEERING
GRANT NGR 32-003-027

1 Sep 1965 to 31 Aug 1970

James E. Weiss, Director, 1965--1969
John J. Monagle, Director, 1969-1970

I. Introduction

This final report on the NASA University Sustaining Grant program at New Mexico State University includes a complete list of projects supported by title and principal investigator, a grouping of projects by discipline with principal investigator, and summary reports for the final year of the program (September 1, 1969 to August 31, 1970).

Reports of research progress in projects supported by these grants have been summarized in a series of semi-annual reports (I--VI) previously submitted to the National Aeronautics and Space Administration.

In addition to this information, some general comments are given with respect to the methods by which projects to be supported were selected, general progress under the grant, and the importance of the program to New Mexico State University.

II. Criteria for Support

As shown in Appendix I, strenuous efforts were made to provide broad program support across the University in the use of the NASA Sustaining Grant funds. The intent of the program to support space related activities and particularly to encourage interdisciplinary work in the space sciences and related areas was a designated criterion applied in all cases in the selection of the projects to be supported. Proposals

were sought from interested faculty members, and projects were supported based on the following additional criteria:

1. Quality of the proposal
2. Utility in space sciences or potential development of skills in the space sciences area, especially in interdisciplinary areas
3. Development of a core of data which could be used in expansion of the research program to be supported by other funds
4. Educational benefits to be derived for the space sciences
5. Disciplinary benefits to be derived for the space sciences
6. Cost of the research

During the first four years of the program, proposals were reviewed by a committee appointed by the vice president for research under the direction of the director of the Research Center at New Mexico State University. During the fifth year, because of a reorganization in research structure, the responsibility for assignment of available funds was assumed by the dean of the College of Arts and Sciences as director of the Research Center of Arts and Sciences.

III. Summary of Personnel Supported and Publications Issued

During the five-year grant period, a total of 43 principal investigators, 62 graduate students, and 20 undergraduate students received support. Approximately 31 articles in scientific journals, 9 theses or dissertations, and 1 film were produced as a direct result of work conducted under this grant, and 33 papers were presented at regional, national, and international scientific meetings. These are listed in appendices.

IV. Areas Covered Under NASA Institutional Grant

Much of the work during the five-year period followed five general themes:

1. Atmospheric studies

2. Planetary, stellar and solar astronomy and associated mathematics, physics, and geology
3. Research Related to phenomena in extreme environments (high temperatures, vacuum, cryogenic temperatures, and radiation)
4. Materials science
5. Regional economic aspects of the space program

Projects following these themes as well as miscellaneous projects are listed below:

1. Atmospheric Studies

Principal Investigator(s)	Department	Project
Good, W. B.	Physics	A Direct Sensing Method for the Determination of the Vertical Temperature Profile of the Atmosphere to 100 Km
Liefeld, R. J.	Physics	Upper Atmosphere Soft X-Ray Detector
Smith, B. A.	Astronomy	Investigation of Upper Atmosphere Winds and Cloud Stability
Good, W. B.	Physics	Index of Refraction of Supercooled Water as a Function of Temperature
Burr, A. F.	Physics	Resonant Detector
O'Brien, R. T.	Biology	Taxonomic Studies in the Genus Pseudomonas by Gas Chromatography

2. Planetary, Stellar and Solar Astronomy and Associated Mathematics, Physics, and Geology

Reitmeyer, W. L.	Astronomy	Development of an Astronomy Research Program: Installation and Operation of a 24-Inch Telescope and Related Equipment
Tombaugh, C. W. King, W. E.	Astronomy Earth Sci.	Geological Studies Applicable to Interpretation of Some Features on Mars
Smith, B. A.	Astronomy	South African Photoelectric Observations of Mars

Seager, W. R. Clemons, R. E.	Earth Sci.	Comparison of Geologic Features in the Sierra de las Uvas-Selden Canyon Area to Luna Features
Seeger, C. L.	Astronomy	Stellar Occultations
Cuffey, J.	Astronomy	Astronomical Seeing and Transparency Tests at a Site for a Proposed 40-Inch Reflector (Magdalena Peak)
Beebe, H. A.	Astronomy	Adaptation for Use with NMSU Facilities of Computer Subprograms for the Interpretation of Solar Ultraviolet Spectra
Julian, W. H.	Mathematics	Stellar Dynamics

3. Research Related to Phenomena in Extreme Environments (High Temperatures, Vacuum, Cryogenic Temperatures, and Radiation)

Stromberg, T. F.	Physics	Low Temperature Research (Super Conductivity)
Daybell, M.	Physics	Investigation of the Mechanism of Charge Transport in Superfluid Helium Using a New Technique for Charge Injection
Evans, L. R.	Chemistry	Kinetic Studies in a Magnetic Field
Ewing, G. J.	Chemistry	Xenon-Hemoglobin and Myoglobin Interaction
Whitford, W. G.	Biology	Physiology of Aestivation in Desert Amphibians
Whitford, W. G.	Biology	Research on Extreme Environments-Aestivation Physiology
Krabbenhoft, K.	Biology	Studies of Mechanism of Radiation Resistance in Micrococcus Radiodurans
Richardson, A. E.	Chemistry	Collisional Deactivation of Very Highly Excited Product Molecules Produced by Atoms Recoiling from Nuclear Reactions
Weeks, O. B.	Biology	Light Induced Biosynthesis of Carotenoids in Flavobacterium dehydrogenans

4. Materials Science

Cobble, M. H.	Mech. Eng.	Irradiation in Transparent Solids
Cobble, M. H.	Mech. Eng.	Finite Transform Solutions for Vibration Problems
Kunz, K. S.	Elec. Eng.	Theoretical Study of the Propagation of an Electromagnetic Wave in Dynamic Media
Theimer, O.	Physics	Propagation of Electromagnetic Waves Through an Ionized Gas with Plasma Frequency ω_p Close to the Radiation Frequency ω
Theimer, O.	Physics	Scattering of Laser Beam by Gases at Various Pressures and Temperatures, Including the Neighborhood of the Critical Point
Theimer, O.	Physics	Theoretical Study of the Equilibrium Velocity Distribution of the Free Electrons in a Plasma
Theimer, O.	Physics	The Wave-Length Dependence of the Electrical Plasma Conductivity
Alexander, M. D.	Chemistry	Coordination Polymers of Cobalt(III)
Goedecke, G. H.	Physics	Electromagnetic Field Associated with Oscillating but Nonradiating Charge Distributions
Ames, L. L.	Chemistry	High Temperature Thermodynamic Studies on the Rare-Earth Gaseous Monosulfides, Gaseous Dicarbides and Solid Hexaborides
Dressel, R. W.	Physics	Electron Interactions with Atomic Field
Liefeld, R. J.	Physics	Electron Excitation of the L_{III} Shell Electrons in Bulk Nickel
Ram, B.	Physics	Λ-N Interactions
Ram, B.	Physics	On Hadron Interactions
Van Heuvelen, A.	Physics	EPR Studies of Chemiluminescent Oxidation of Luminol
Hill, R. D.	Chemistry	Acid-Base Equilibria in Non-Aqueous Solvents; Establishment of a "pH" Scale in Non-Aqueous Solvents

Monagle, J. J. Richardson, A. E.	Chemistry	Polymers Containing the Phosphoryl Linkage for Use of Heat and Radiation Resistant Materials

5. Regional Economic Aspects of the Space Program

Beckstead, R. W. Downs, F. T. Loveland, J. P. Zickefoose, P. W.	Bus. Adm. and Economics	Economic Impact of the Apollo Project on Las Cruces
Downs, F. T.	Bus. Adm.	Impact of the NASA Apollo Project on the Labor Market Behavior of Selective Sectors of the Las Cruces Labor Force: Professional, Technical and Kindred, and Clerical and Kindred Workers
Downs, F. T.	Bus. Adm.	Selective Labor Force Response to Expanding Job Opportunities Derived from the Economic Effects of a NASA Facility

6. Miscellaneous

Peterson, F. Peterson, R.	Earth Sci.	Geologic and Geographic Studies from Space Photographs
Dalton, L.	Speech	Pre-Nystagmus Cortical Activity
Adams, J. M.	Comp. Sci.	Research in Computer Language
Fishkin, A. F.	Chemistry	Glycoprotein Composition of Veins

Projects grouped by discipline are given in Appendix II. For interdisciplinary projects, listing is made in the discipline with chief responsibility for the project.

V. Significance of NASA Institutional Grant Support

In the sense of providing funds for growth in the space sciences and related areas, the NASA Sustaining University Grant has been a powerful stimulus for the inauguration of a variety of research programs and the strengthening of training and education in space related areas at New Mexico State University. Predominant among the benefits to space sciences has been

the rapid development of the area of astronomy, initially through the planetary astronomy program and equipment purchased for the planetary observatory. This effort resulted in the development of a general astronomy program, first within the Department of Earth Sciences and Astronomy; then, in July, 1970, by the establishment of a separate Department of Astronomy and the inauguration of a doctoral program in this area. The department now has available two observatories, one for planetary and one for stellar observation, and is just completing a campus observatory for instructional purposes. Without question the astronomy program at New Mexico State University, although ideally located and now a coherent operation, would not have been possible without the initial nucleus of staff and equipment provided by the NASA Sustaining University Grant and other NASA grant funds.

While this program is easily identifiable in terms of space sciences, other areas of science have been strongly stimulated in directions which will be highly useful in closely related areas in the future. For example, early support in Physics under the Sustaining Grant Program has led to a continued and growing interest in the physics of the upper atmosphere at New Mexico State University. This interest has now broadened to include relationship of the atmosphere to the environment, and the Department of Physics is now considering this area as a possible major area of concentration within its graduate program.

Without question, this grant program provided the first direct impetus for concentration of a variety of disciplinary talents to solution of complex problems. Although there is no funding program of this specific type now available to University personnel, the need for interdisciplinary cooperation has become increasingly recognized and implemented.

The main research groups established under the aegis of this grant have been able to remain essentially intact by obtaining funds for other sources, but the flexibility of these groups has been reduced, and the possibility of organizing other new groups sharply limited by the termination of the program. With the growing need for fundamental information which can best be assembled by interdisciplinary cooperation among investigators, the need for flexible funds available for new ventures is great and should be provided by a sustaining grant program or similar programs.

Appendix I

PROJECTS SUPPORTED BY NASA UNIVERSITY SUSTAINING GRANT
NGR 32-003-027

1965-1970

Principal Investigator(s)	Projects
Adams, J. M.	Research in Computer Language
Alexander, M. D.	Coordination Polymers of Cobalt(III)
Ames, L. L.	High Temperature Thermodynamic Studies on the Rare-Earth Gaseous Monosulfides, Gaseous Dicarbides and Solid Hexaborides
Beebe, H. A.	Adaptation for Use with NMSU Facilities of Computer Subprograms for the Interpretation of Solar Ultraviolet Spectra
Burr, A. F.	Resonant Detector
Cobble, M. H.	Finite Transform Solutions for Vibration Problems
Cobble, M. H.	Irradiation in Transparent Solids
Cuffey, J.	Astronomical Seeing and Transparency Tests at a Site for a Proposed 40-Inch Reflector (Magdalena Peak)
Dalton, L.	Pre-Nystagmus Cortical Activity
Daybell, M.	Investigation of the Mechanism of Charge Transport in Superfluid Helium Using a New Technique for Charge Injection
Downs, F. T.	Impact of NASA Apollo Project on the Labor Market Behavior of Selective Sectors of the Las Cruces Labor Force: Professional, Technical and Kindred, and Clerical and Kindred Workers
Downs, F. T.	Selective Labor Force Response to Expanding Job Opportunities Derived from the Economic Effects of a NASA Facility
Dressel, R.	Electron Interactions with Atomic Nuclei
Evans, L. R.	Kinetic Studies in a Magnetic Field
Ewing, G. J.	Xenon Hemoglobin and Myoglobin Interaction
Fishkin, A. F.	Glycoprotein Composition of Veins
Goedecke, G. H.	Electromagnetic Field Associated with Oscillating but Nonradiating Charge Distributions

Principal Investigator(s)	Projects
Good, W. B.	A Direct Sensing Method for the Determination of the Vertical Temperature Profile of the Atmosphere to 100 Km
Good, W. B.	Index of Refraction of Supercooled Water as a Function of Temperature
Hill, R. D.	Acid-Base Equilibria in Non-Aqueous Solvents; Establishment of a 'pH' Scale in Non-Aqueous Solvents
Julian, W. H.	Stellar Dynamics
Krabbenhoft, K.	Studies of Mechanism of Radiation Resistance in Micrococcus Radiodurans
Kunz, K. S.	Theoretical Study of the Propagation of an Electromagnetic Wave in Dynamic Media
Liefeld, R. J.	Electron Excitation of the L_{III} Shell Electrons in Bulk Nickel
Liefeld, R. J.	Upper Atmospheric Soft X-Ray Detector
Loveland, J. P. Beckstead, R. W.	Economic Impact of the Apollo Project on Las Cruces
Monagle, J. J.	Polymers Containing the Phosphoryl Linkage for Use of Heat and Radiation Resistant Materials
O'Brien, R. T.	Taxonomic Studies in the Genus Pseudomonas by Gas Chromatography
Peterson, F. Peterson, R.	Geologic and Geographic Studies from Space Photographs
Ram, B.	Λ-N Interactions
Ram, B.	On Hadron Interactions
Reitmeyer, W. L.	Development of an Astronomy Research Program
Reitmeyer, W. L.	Sky Atlas
Richardson, A. E.	Collisional Deactivation of Very Highly Excited Product Molecules Produced by Atoms Recoiling from Nuclear Reactions
Seager, W. R. Clemons, R. E.	Comparison of Geologic Features in the Sierra de las Uvas-Selden Canyon Area to Luna Features
Seeger, C. L.	Stellar Occultations
Smith, B. A.	Investigation of Upper Atmosphere Winds and Cloud Stability

Principal Investigator(s)	Projects
Smith, B. A.	Construction of a 24-Inch Telescope
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Stromberg, T. F.	Low Temperature Research (Super Conductivity)
Theimer, O.	Propagation of Electromagnetic Waves Through an Ionized Gas With Plasma Frequency ω_p Close to the Radiation Frequency ω
Theimer, O.	Scattering of Laser Beam by Gases at Various Pressures and Temperatures, Including the Neighborhood of the Critical Point
Theimer, O.	Theoretical Study of the Equilibrium Velocity Distribution of the Free Electrons in a Plasma
Theimer, O.	The Wave-Length Dependence of the Electrical Plasma Conductivity
Tombaugh, C. W. King, W. E.	Geological Studies Applicable to Interpretation of Some Features on Mars
Van Heuvelen, A.	EPR Studies of Chemiluminescent Oxidation of Luminol
Weeks, O. B.	Light Induced Biosynthesis of Carotenoids in Flavobacterium dehydrogenans
Whitford, W. G.	Physiology of Aestivation in Desert Amphibians
Whitford, W. G.	Research on Extreme Environments-Aestivation Physiology
Zickefoose, P. W. Beckstead, R. W. Downs, F. T.	Economic Impact of the Apollo Project on Las Cruces

Appendix II

PROJECTS SUPPORTED BY NASA UNIVERSITY SUSTAINING GRANT
NGR 32-003-027

(By Discipline)

1965-1970

Astronomy

Beebe, H. A.	Adaptation for Use with NMSU Facilities of Computer Subprograms for the Interpretation of Solar Ultraviolet Spectra
Cuffey, J.	Astronomical Seeing and Transparency Tests at a Site for a Proposed 40-Inch Reflector (Magdalena Peak)
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Smith, B. A.	Operation of the 24-Inch Telescope
Smith, B. A.	South African Photoelectric Observations of Mars
Tombaugh, C. W. King, W. E.	Geological Studies Applicable to Interpretation of Some Features on Mars

Biology

Krabbenhoft, K.	Studies of Mechanism of Radiation Resistance in Micrococcus Radiodurans
O'Brien, R. T.	Taxonomic Studies in the Genus Pseudomonas by Gas Chromatography
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Ames, L. L.	High Temperature Thermodynamic Studies on the Rare-Earth Gaseous Monosulfides, Gaseous Dicarbides and Solid Hexaborides

Evans, L. R.	Kinetic Studies in a Magnetic Field
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Richardson, A. E.	Collisional Deactivation of Very Highly Excited Product Molecules Produced by Atoms Recoiling from Nuclear Reactions

Computer Science

Adams, J. M.	Research in Computer Language

Earth Sciences

Clemons, R. E. Seager, W. R.	Comparison of Geologic Features in the Sierra de las Uvas-Selden Canyon Area to Luna Features
King, W. E. Tombaugh, C. W.	Geological Studies Applicable to Interpretation of Some Features on Mars
Peterson, F. Peterson, R.	Geologic and Geographic Studies from Space Photographs

Economics

Beckstead, R. W. Loveland, J. P.	Economic Impact of the Apollo Project on Las Cruces
Downs, F. T.	Impact of NASA Apollo Project on the Labor Market Behavior of Selective Sectors of the Las Cruces Labor Force: Professional, Technical and Kindred, and Clerical and Kindred Workers
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Beckstead, R. W. Downs, F. T. Zickefoose, P. W.	Economic Impact of the Apollo Project on Las Cruces

Mathematics

Julian, W. H.	Stellar Dynamics

Mechanical Engineering

Cobble, M. H.	Irradiation in Transparent Solids

Physics

Burr, A. F.	Resonant Detector
Daybell, M.	Investigation of the Mechanism of Charge Transport in Superfluid Helium Using a New Technique for Charge Injection
Dressel, R.	Electron Interactions with Atomic Nuclei
Goedecke, G. H.	Electromagnetic Field Associated with Oscillating but Nonradiating Charge Distributions
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Theimer, O.	The Wave-Length Dependence of the Electrical Plasma Conductivity
Van Heuvelen, A.	EPR Studies of Chemiluminescent Oxidation of Luminol

Speech

Dalton, L. Pre-Nystagmus Cortical Activity

Appendix III

PUBLICATIONS, DISSERTATIONS, THESES, AND FILMS

Discipline	Publications
Astronomy	Cuffey, J.; Astronomical Seeing Tests with Diurnal Trails; Contr. Observ. NMSU, Vol. 1, No. 1 (1967)
	Cuffey, J.; The Magdalena Peak Observatory Site; Contr. Observ. NMSU, Vol. 1, No. 2 (1968)
	Pope, T. P. and E. J. Reese; Rotation of Ultraviolet Markings on Venus; Proc. 1967 Joint Conv. of Western Amateur Astr. and the Assoc. of Lunar and Planetary Observs.(1967)
	Reese, E. J.; Jupiter: A New Dark Streak; Sky and Telescope (1968)
	Robinson, J. C.; Mars: Correlation of Radar and Optical Observations; Science (1968)
	Smith, B. A.; Rotation of Venus: Continuing Contradictions; Science, 158, 114 (1967)
	Smith, B. A.; Observations of Io at Inferior Geocentric Conjunction; NMSU Observ. Contr.(1968)
Biology	Krabbenhoft, K. L., A. W. Anderson, and P. R. Elliker; Ecology of Micrococcus radiodurans; Appl. Microbiol., 13, 1030-1037 (1965)
	Krabbenhoft, K. L., A. W. Anderson, and P. R. Elliker; Influence of Culture Media on the Radiation Resistance of Micrococcus radiodurans; Appl. Microbiol., 15, 178-185(1967)
	Krabbenhoft, K. L., A. W. Anderson, and P. R. Elliker; Radiation Resistance and Pigmentation in Micrococcus radiodurans; Bacteriol. Proceed., A12 (1966)
	O'Brien, R. T.; Differentiation of Bacteria by Gas Chromatographic Analysis of Products of Glucose Catabolism; Food Technol. 21, 78-80 (1967)
	O'Brien, R. T.; Detection of Escherichia coli by Gas Chromatography; J. Bacteriol. (1968)
	Weeks, O. B., and R. J. Garner; Biosynthesis of Carotenoids in Flavobacterium dehydrogenans; Arch. Biochem. Biophys., 121, 35 (1967)

Weeks, O. B., S. L. Jensen, D. Thirkell and R. H. C. Strang; Identity of the Novel C_{50}-Carotenoid dehydrogenans-P439 and Sarcinaxanthin; Nature, 214, 379 (1967)

Weeks, O. B., D. Hester, and R. J. Garner; Carotenoid Pigments of Gram Positive Bacteria; Bacteriol. Proc. 32 (1967)

Jensen, S. L., S. Hirtzberg, O. B. Weeks, and U. Schweiter; Bacterial Carotenoids XXVI. 2. Structure Determination of dehydrogenans-P439; Acta Chem. Scand. 22 (1968)

Weeks, O. B.; Carotenoid Biosynthesis in Flavobacterium dehydrogenans; Norwegian Journ. Chem., Mining, and Metall. 26, 127 (1966)

Jensen, S. L., and Weeks, O. B.; A Novel C_{50} Carotenoid; Norwegian Journ. Chem., Mining, and Metall., 26, 125 (1966)

Whitford, W. G.; Heart Rate and Changes in Body Fluids in Aestivating Toads from Xeric Habitats, Physiological Systems in Semi-Arid Environments; NSF Symposium, Univ. of New Mexico Press.

Whitford, W. G.; Physiological Responses to Temperature and Dessication in the Endemic New Mexico Plethodontids, Plethodon neomexicanus and Aneides hardii; Copeia (1967)

Chemistry

Alexander, M. D., and T. E. Nappier, Jr.; Chloropentamine-cobalt(III) Complexes Containing Monodentate Propylene-diamine; Chem. Commun., London, 85 (1967)

Ewing, G. J., and S. Maestas; Xenon-Metmyoglobin Equilibrium; Cur. Mod. Biol., 1, 148 (1967)

Earth Sciences

Seager, W. R., R. E. Clemons, and J. W. Hawley; Geology of the San Diego Mountain Area, Dona Ana County; New Mexico Bureau of Mines and Mineral Resources, Geologic Map Series (in press)

Mechanical Engineering

Cobble, M. H., P. C. Fang, and E. Lumesdaine; Verification of the Theory of the Thermal Trap; J. Franklin Institute, Vol. 282, No. 2, pp 102-107 (1966)

Cobble, M. H.; Finite Transform Solution of the Damped, Clamped-Clamped Beam Having Distributed Load and Elastic Support; Journ. of the Acoustical Society of America, (Nov. 1966)

Cobble, M. H.; Finite Transform Solution of the General Conical Cantilever Beam; Proc. Soc. of Engr. Sci., 4th Tech. Meeting, North Carolina State University, Raleigh, (Nov., 1966)

Cobble, M. H.; Displacement of a Damped Track Subject to a Moving Load; Southwestern and Rocky Mountain Division, AAAS, 43rd Annual Meeting (May, 1967)

Cobble, M. H., and P. C. Fang; Finite Transform Solution of the Damped Cantilever Beam Equation Having Distributed Load Elastic Support and the Wall Edge Elastically Restrained Against Rotation; J. of Sound and Vibration, 6, (2), 187-198 (1967)

Cobble, M. H., and R. M. Walker; Tidal Oscillations in a Convergent Channel; Can. Congr. Appl. Mech., Centennial Year 1967, Universite Laval, Quebec, Can., (May, 1967)

Cobble, M. H.; Nonlinear Heat Transfer of Solids in Orthogonal Coordinate Systems; Internat. Journ. Nonlinear Mech., 2, 417-426 (1967)

Cobble, M. H.; Finite Transform Solution for the Temperature of a Plate Heated by a Continuous Moving Source; Internat. Journ. Heat and Mass Trans., 10, 1281-1289 (1967)

Discipline	Dissertations and Theses
Biology	Prieto, Andrew; Physiological Responses to Temperature in Two Species of Horned Lizards, Phrynosoma cornutum and Phrynosoma douglassi; M. S. Thesis, NMSU (1967)
	Dreiling, C. E.; Anaerobic Metabolism in Two Species of Aestivating Toads, Bufo cognatus and Seaphiopus hammondi; M. S. Thesis, NMSU (1967)
Chemistry	Fuchs, Helmuth; The Effects of a Magnetic Field on Reaction Kinetics; M. S. Thesis, NMSU (1967)
Physics	Arnett, Jerald; Conditions for Non-Radiation and Their Relationship to Conservation Laws in Classical Field Theory; Ph. D. Dissertation, NMSU (1967)
	Ender, Traugott; Yield and Energy Distribution of Alpha Particles at 145 Degrees from ^{12}C by 15-MeV Electrons; Ph. D. Dissertation, NMSU (1967)
	James, John; Lambda-Nucleon Interaction Potentials; M. S. Thesis, NMSU (1969)
	Muir, Douglas; A High-Resolution Energy-Loss Analyzer for Inelastic Electron Scattering; Ph. D. Dissertation, NMSU (1968)

Osterlitz, Barry; Electron Paramagnetic Resonance as a Chemiluminescent System with Cu^{++} Ions as Catalysts; M. S. Thesis, NMSU (1967)

Wright, Thomas; Statistical Mechanics of the Free Electrons in a Partially Ionized Plasma; Ph. D. Dissertation, NMSU, (1969)

Discipline	Film
Biology	Whitford, W. G.; A film of approximately 10 minutes was produced and forwarded to the British Broadcasting Company. The film depicts the life of animals living under extreme desert environments, and will be included in an hour-long scientific film on space by the BBC.

Appendix IV

PAPERS PRESENTED AT REGIONAL NATIONAL,
AND INTERNATIONAL MEETINGS

Principal Investigator & Discipline	Paper Presented
J. M. Adams, Computer Science	"STRIGOL," Edward Harris and J. M. Adams, Rio Grande Chapter of the Association for Computing Machinery, Albuquerque, New Mexico, February 2, 1967
M. D. Alexander, Chemistry	"Chloropentaminecobalt(III) Complexes Containing Monodentate Propylenediamine," M. D. Alexander, T. E. Nappier, Jr., and Charles R. Spillert, AAAS 43rd Annual Meeting and Arizona Academy of Science Annual Spring Meeting, Tucson, Arizona, 1967
M. H. Cobble, Mechanical Engineering	"Irradiation into Transparent Solids and the Thermal Trap Effect," M. H. Cobble, Conference on Pure and Applied Mathematics, Socorro, New Mexico, February 16, 1966
M. H. Cobble, Mechanical Engineering	"Thermal Trap-Theoretical Prediction and Experimental Verification, M. H. Cobble, E. Lumsdaine (NASA Fellow), and P. Fang, Annual Solar Energy Conference, Boston, Mass., March 22, 1966
M. H. Cobble, Mechanical Engineering	"Finite Transform Solution of the General Conical Cantilever Beam Problem," M. H. Cobble, Fourth Technical Meeting of the Society of Engineering Science, North Carolina State University, Raleigh, North Carolina, October 31-November 9, 1966
James Cuffey, Astronomy	"The Magdalena Peak Site," James Cuffey, Neighborhood Astronomers, Austin, Texas, March 4, 1967
James Cuffey, Astronomy	"Astronomical Seeing," James Cuffey, Las Cruces Astronomical Society, November 19, 1966

James Cuffey, Astronomy	"Evaluation of Astronomical Seeing," James Cuffey, Physics and Astronomy Department, University of New Mexico, Albuquerque, New Mexico, April 7, 1967
James Cuffey, Astronomy	"Detection and Measurement of Astronomical Seeing, James Cuffey, White Sands Missile Range, New Mexico, SPIE, May 3, 1967
Ralph Dressel, Physics	"Electron Interactions," Ralph Dressel, American Association for the Advancement of Science, New Mexico State University, May 2, 1966
Gordon Ewing, Chemistry	"Xenon-Hemoglobin Interaction," Gordon Ewing and Sigfredo Maestas, ACS Meeting, NMSU, April, 1967
Gordon Ewing, Chemistry	"Xenon-Hemoglobin Interaction," Gordon Ewing, AAAS 42nd Annual Meeting, Las Cruces, New Mexico, May, 1966
Arthur F. Fishkin, Chemistry	"Electrophoretic Patterns of Glycoprotein from Blood Vessels of Fetal Cattle," Arthur F. Fishkin, West Coast Connective Tissue Society, Los Angeles, California, August, 1967
Arthur F. Fishkin, Chemistry	"Studies on Glycoproteins from Fetal Cattle Aorta, Arthur Fishkin, AAAS Meeting, Tucson, Arizona, April, 1967
Arthur F. Fishkin, Chemistry	"Gelatinase Activity of Extracts from the Larvae of Dermestidae," Arthur F. Fishkin, ACS Meeting, NMSU, April, 1967
Arthur F. Fishkin, Chemistry	"Concerning the Glycoproteins of Veins," Arthur F. Fishkin, ACS Meeting, NMSU, April, 1967
R. Dean Hill, Chemistry	"Phenolphthalein as an Acid-Base Indicator in Liquid Ammonia, R. D. Hill, ACS Meeting, New York, September, 1966
R. Dean Hill, Chemistry	"Ionic Mobility of the Hydrazine Ion in Hydrazine," G. Baca and R. D. Hill, ACS Meeting, San Francisco, California, April, 1968

R. Dean Hill, Chemistry	"Phenolphthalein as an Acid-Base Indicator in Liquid Ammonia, R. D. Hill, ACS Meeting, Carlsbad, New Mexico, April, 1966
Kenneth Krabbenhoft, Biology	"Radiation Resistance and Pigmentation of Micrococcus radiodurans," K. L. Krabbenhoft, A. W. Anderson, and P. R. Elliker, American Society of Microbiology, Los Angeles, California, May, 1966
Kenneth Krabbenhoft, Biology	"Chromatographic Studies on the Pigments of Micrococcus radiodurans," K. L. Krabbenhoft and J. E. Blaine, SW Regional Meeting of the AAAS, Tucson, Arizona, 1967
Kaiser S. Kunz, Electrical Engr.	"Electromagnetic Wave Propagation in a Medium Whose Permittivity is Varied Acoustically," K. S. Kunz and R. E. Duren, American Physical Society, Hawaii, September, 1969
Robert T. O'Brien, Biology	"Gas Chromatographic Studies on Gram Negative Bacteria," R. T. O'Brien, American Society for Microbiology, October, 1967
Bradford A. Smith, Astronomy	"Motions of Ultraviolet Clouds on Venus," B. A. Smith, XIII General Assembly of the International Astronomical Union, Prague, Czechoslovakia, 1967.
Bradford A. Smith, Astronomy	"Motions of Ultraviolet Clouds on Venus," B. A. Smith, Geological Sciences Seminar, California Institute of Technology, Pasadena, California, 1967
Clyde Tombaugh, Astronomy and Earth Sciences	"Observed Behavior of Martian Features and Phenomena, and Infrared Geology," C. W. Tombaugh, Rice University, Houston, Texas, 1966
Clyde Tombaugh, Astronomy and Earth Sciences	"Mars and Its Geology," C. W. Tombaugh, University of Chihuahua, Chihuahua, Mexico, May, 1966
Owen B. Weeks, Chemistry/Biology	"Carotenoid Biosynthesis in Flavobacterium dehydrogenans," O. B. Weeks, International Symposium on Carotenoids, Norwegian Technical University, Trondheim, Norway, June, 1966

Owen B. Weeks, Chemistry/Biology	"A Novel C_{50} Carotenoid," S. L. Jensen and O. B. Weeks, International Symposium on Carotenoids, Norwegian Technical University, Trondheim, Norway, June, 1966
Owen B. Weeks, Chemistry/Biology	"Carotenoids of Gram Positive Bacteria," O. B. Weeks, D. J. Hester, and R. J. Garner, National Meeting, American Society of Microbiology, New York, May, 1967
Walter G. Whitford, Biology	"Physiological Responses to Temperature and Dessication in the Endemic New Mexico Plethodontids, Plethodon neomexicanus and Aneides hardii," ASIH Meeting, San Francisco, California, June, 1967
Walter G. Whitford, Biology	"Aestivation in Southwestern Amphibians," Andrew Prieto and W. G. Whitford, Southwestern Division of AAAS, NMSU, May, 1966
Walter G. Whitford, Biology	"Aspects of the Ecology and Physiology of Aestivation in Southwestern Amphibians," W. G. Whitford, American Society of Ichthyologists and Herpetologists, Miami, Florida, June, 1966

Appendix V

GRADUATE STUDENTS

Name	NMSU Degree	Present Location
Biology		
Anderson, Gary	M. S., 1966	Ph. D. candidate, University of Indiana
Berry, R. A.	M. S., 1968	Ph. D. candidate, NMSU
Blaine, James E.		Ph. D. candidate, NMSU
Boswell, Thomas O.	M. S., 1967	Ph. D. candidate, NMSU
Cecchini, Gary	M. S., 1968	Ph. D. candidate, University of Illinois
Dano, N. J.		No information
Farnham, Bruce	M. S., 1969	No information
Goldstein, Raymond	M. S., 1968	Ph. D. candidate, University of Nebraska
Medica, Philip	M. S., 1966	UCLA Mercury Lab., Nevada
Milbourn, R. W.	M. S., 1969	Head of Medical Lab., Michigan
Prieto, Andrew	M. S., 1968	Ph. D. candidate, University of Missouri
Sherman, Robert	M. S., 1968	United States Air Force
Shiffler, Wendell	M. S., 1968	Teaching school, Alaska
Spangler, Peter	M. S., 1968	No information
Sterling, Terri	B. S., 1967	Biology Lab., New Orleans, Louisiana
Wakefield, C. J.		Teaching high school
Wright, Gary	M. S., 1969	U. S. Army
Chemistry		
Andrewes, Arthur	Ph. D., 1970	Postdoc. Student, University of Wisconsin
Baca, Glenn	Ph. D., 1969	Asst. Prof. Chem., Rose Polytechnic Inst.
Bigelow, Brooks		Ph. D. candidate, NMSU
Felt, Robert	Ph. D., 1971	Postdoc., Purdue University, Indiana
Filby, Evan	Ph. D., 1971	No information
Fuchs, Helmuth	M. S., 1966	Ph. D. candidate, Delphi University
Gill, Gary		Ph. D. candidate, Memphis St. Univ.
Griffin, Walter		No information
Ionescu, Lavinel	Ph. D., 1970	M. D. candidate, UNM Medical School
Levitt, Barbara		Chemistry Dept., Univ. Texas at El Paso
Maestas, Sigfredo	Ph. D., 1969	Dir. Inst. Scient. Res. and Asst. Prof. Chem., Highlands University
Nappier, Thomas	M. S., 1967	Ph. D. candidate, Ohio State University
Saleh, Fayek	Ph. D., 1970	Postdoc., UNM Medical School
Schluter, Leonard		Ph. D. candidate, NMSU
Shear, Stephen	M. S., 1969	No information
Smith, Edwin		Ph. D. candidate, NMSU
Spillert, Charles	Ph. D., 1969	Asst. Prof. Chem., Jacksonville University
McGrath, L.		Ph. D. candidate, NMSU
Witt, Phillip	M. S., 1968	No information
Computer Science		
Harris, Edward	M. S., 1969	Ph. D. candidate, University of Wisconsin

Mechanical Engineering

Augustus, K. Joseph	D. Sc., 1968	Ph. D. candidate and Teaching in General Engr. Dept., Univ. of Hawaii
Fang, P. C.	D. Sc., 1967	General Electric, Computer Section
Lumsdaine, E.	D. Sc., 1966	Assoc. Prof. Mech. Engr., So. Dakota State University

Physics

Arnett, Jerald	Ph. D., 1967	General Dynamics, Houston, Texas
Canaday, Jon		Ph. D. candidate, Louisiana St. Univ.
Chamberlain, M.	Ph. D., 1970	Physics Dept., Ball St. Univ., Muncie, Ind.
Duren, Richard	Ph. D., 1969	Physicist, Aircraft Co., Ft. Worth, Tex.
Ender, Traugott	Ph. D., 1968	McDonald Aircraft, Ft. Worth, Texas
James, John	M. S., 1969	White Sands Missile Range, New Mexico
Kirby, Thomas		Ph. D. candidate, NMSU
Knuckles, C. F.		Astronomy Dept., NMSU
Lehman, James	M. S., 1968	Applied Physics, Albuquerque, N. M.
McDonald, Carlos		Ph. D. candidate, NMSU
Mozer, Charles		Graduate School, NMSU
Muir, Douglas	Ph. D., 1968	Los Alamos Scientific Lab., New Mexico
Osterlitz, Barry	M. S., 1968	RCA, Lancaster, Pennsylvania
Phelan, James		White Sands Missile Range
Robinson, J. C.		Graduate School, NMSU
Robinson, M. D.		Washington, D. C., Naval Laboratory
Sollid, Jon E.	Ph. D., 1967	General Dynamics, Ft. Worth, Texas
Sweet, Wayne	M. S., 1968	Flight Instructor, El Paso, Texas
Turtle, Robert	Ph. D., 1971	No information
Wiggins, Carl		Ph. D. candidate, NMSU
Wright, Thomas	Ph. D., 1969	No information
Yodzis, Peter	Ph. D., 1969	Postdoc., Dublin Inst. for Adv. Studies

Appendix VI

UNDERGRADUATE STUDENTS

Name	NMSU Degree	Present Location
Biology		
Bryan, James		Holloman Air Force Base, New Mexico
Garner, Ron J.	B. S., 1967	Univ. of New Mexico Medical School
Slavens, Forrest	B. A., 1970	No information
Chemistry		
Biskup, Elizabeth	B. S., 1968	Teaching school, Anthony, New Mexico
Cooper, Mary Faith	B. S., 1967	Graduate School
Day, Phyllis	B. S., 1967	Chemist, Dallas, Texas
Krauth, Gary	B. S., 1970	Graduate School, NMSU
Nenninger, Franke	B. S., 1967	Graduate School, Memphis St. Univ.
Nicholson, Stephanie	B. S., 1968	Graduate School, NMSU
Sherrill, Bette	B. S., 1966	Graduate School, SMU, Dallas, Texas
Earth Sciences		
Danley, William		Undergraduate student, NMSU
Downey, Lewis	B. S., 1970	United States Army
Mangum, Carl	B. S., 1970	Graduate School, University of Arkansas
Redman, Earl	B. S., 1970	United States Army
Physics		
Hermes, Robert		Undergraduate student, NMSU
Waddell, R. G.		No information
Business Administration and Economics		
Daniel, Ernest Q.	B. B. A., 1966	No information
Fritz, R. L.		Undergraduate student, NMSU
Hutton, Roger A.		Undergraduate student, NMSU
Owens, Jimmie K.	B. B. A., 1967	No information